A Nationwide Study Comparing Knowledge and Beliefs about HPV among Female Students before and after HPV Vaccination

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ABSTRACT

Study Objective: To assess the knowledge and beliefs regarding HPV and the HPV vaccine among girls before and after vaccination in the Malaysian HPV Immunisation Programme.

Design: A nationwide longitudinal survey.

Setting: Thirty-two randomly selected schools from 13 states and 3 federal territories in Malaysia from February to March 2013, and October to November 2013.

Participants: Form One female students (13-year-old).

Interventions: None.

Main Outcome Measures: Mean knowledge score of HPV infection.

Results: A total of 2,644 students responded to the pre-vaccination survey, of whom 2,005 (70%) completed the post-vaccination survey. The mean knowledge score was 2.72 (SD ± 2.20) out of a maximum score of 10 in the pre-vaccination survey, which increased significantly to 3.33 (SD ± 1.73) after the 3 doses of HPV vaccine (p = 0.001). Many answered incorrectly that, 'Only females can get HPV infection' (91.5% pre-vaccination versus 96.1% post-vaccination), and only a few were aware that, 'Vaccinating boys helps to protect girls against HPV infection' (11.7% for pre-vaccination versus 10.2% for post-vaccination). The mean knowledge score was significantly higher post-vaccination among higher-income families and those with parents of a higher occupational status. Regarding beliefs about the HPV vaccine, 89.4% in the pre-vaccination survey held the view that they would not get a HPV infection, and the percentage remained similar in the post-vaccination survey. Perceived severity of HPV infection also remained low in both pre- and post-intervention groups. Only 21.5% reported receiving health information about HPV along with the provision of the HPV vaccine; those who received health information showed higher levels of knowledge.

Conclusion: Findings revealed a general lack of knowledge and erroneous beliefs about HPV and the HPV vaccine even after receiving vaccination. This suggests that imparting accurate knowledge about HPV along with vaccine administration is essential. Specifically, girls from lower socioeconomic groups should be a target of educational intervention.

Keywords: HPV, Knowledge, Beliefs, Pre-vaccination, Post-vaccination, Female

Introduction

The U.S. Food and Drug Administration have approved 3 vaccines for preventing human papillomavirus infection (HPV) infection. HPV vaccination is most effective when given before a person becomes sexually active during early adolescence.[1] The Advisory Committee on Immunisation Practices (ACIP) of the Centers for Disease Control and Prevention (CDC) and the American Academy of Paediatrics recommend routine vaccination for girls aged 11 or 12 years in order to prevent HPV infections.[2] In Malaysia in 2010, a free national programme called the National HPV Immunisation Program was launched by the Ministry of Health, offering Form One female students a bivalent HPV vaccination that protects against the 2 high-risk types of HPV. Form One is the first year of secondary school and most of the students are 13 years old. The HPV vaccine was given in 3 doses over 6 months to all Form One female students for free, upon getting parental consent.[3] The HPV immunisation programme has been widely accepted since it was introduced in Malaysia in 2010, with more than 95% participation among female students each year.[4]

Vaccination is usually accompanied by targeted public health information and therefore, awareness of HPV appeared to be improving since introduction of the vaccine.[5] For example, a survey in Vietnam showed that girls who were fully vaccinated had a greater knowledge than less fully vaccinated girls.[6] A brief educational intervention before receiving

the HPV vaccine in mainland China also effectively raised knowledge about the virus and vaccine.[7] Although HPV knowledge seemed to increase in many cases, some studies showed otherwise. [8,9] According to Bowyer et al. (2013), after 3 years of the HPV vaccine being offered to 12-13 year old students in England, the first routinely vaccinated cohort demonstrated a poor knowledge of HPV, with half of them failing to understand the relationship between HPV vaccination and cervical cancer prevention.[8]

Since the introduction of the free national HPV Immunisation Programme in Malaysia in 2010, little is known about the level of knowledge and beliefs regarding HPV and the HPV vaccine among girls who received the vaccine. Ideally, our National HPV Immunisation Program should be accompanied by targeted public health information provided by school health teams.[3] It is unclear whether Malaysian adolescent girls receive and retain important information about HPV and the HPV vaccine as they receive the vaccine. The purpose of this study is to assess the level of knowledge and beliefs about HPV and HPV vaccine among Form One female students before and after receiving the HPV vaccination. The study is essential as identifying knowledge deficiencies and misbeliefs may provide insight into the development of future education intervention to be given along with HPV vaccination. The HPV vaccination programme will be more effective if vaccination is given along with adequate education that equips the student with information to protect themselves against HPV infection and cervical cancer.

Materials and Methods

Design and setting

By simple random sampling 2 schools were selected from each of the 13 states and 3 federal territories in Malaysia, giving a total of 32 participating schools. All Form One

97 females in the selected schools were included in the study. Phase I involved surveying all the
98 students before they were given the HPV vaccine under the National HPV Immunisation
99 Programme (February to March 2013). Phase II involved surveying the same female
100 students after completing their third dose of the HPV vaccine in that same year (October to
101 November 2013). Female students who did not receive any doses of the HPV vaccines or
102 who missed one of the phases (pre- or post-vaccination) were excluded from the study.
103
104 *Instruments*
105 A standardized questionnaire was given to each student. The questionnaire assessed
106 demographic characteristics, knowledge and health beliefs related to HPV infection and
107 vaccination. In the knowledge section, respondents were asked a series of 10 questions
108 regarding HPV, the relationship of virus infection to cervical cancer and genital warts, and
109 the effectiveness of the vaccine (10 item scales). They were asked to choose only one reply
110 from 3 given choices of 'true,' 'false' and 'don't know.' A correct response was given a score
111 of one, and an incorrect or 'don't know' was scored as zero. Scores could range from 0 to 10,
112 with higher scores representing greater levels of knowledge.
113 The second section of the questionnaire assessed respondents' health beliefs
114 towards HPV vaccination using the Health Belief Model construct as the theoretical
115 framework,[10] which included general health beliefs (2 items), perceived benefits of the HPV
116 vaccine (1 item), perceived susceptibility to HPV (1 item), concerns about contracting HPV (1
117 item), perceived severity of HPV infection (1 item), and perceived barriers to HPV
118 vaccination (7 items). For each statement, respondents could choose only one of three
119 response categories of 'agree,' 'don't know' and 'disagree.' A positive health belief was

given a score of 1 while a negative health belief or a 'don't know' answer was scored as zero, for a total possible score of 13.

The questionnaire was in 3 languages: Malay, Chinese and English. Each language was pretested before commencing the study. At each selected school, a survey administrator was appointed and briefed on how to correctly administer the survey questionnaires to the students.

Pretesting and validation of study instruments

The questionnaire content was validated by 3 experts from the Department of Social and Preventive Medicine at the University of Malaya to assess the relevance and ensure the clarity of the questions. After minor amendments, the questionnaire was pilot tested on 20 randomly-sampled students who were not included in the actual study. Pilot test participants were included from the 3 main ethnic groups, the Malays, Chinese and Indians. The questionnaire was revised again according to the pilot students' comprehension of the questions. Then, the questionnaire was construct-validated on 150 randomly sampled students and factor loading was calculated to indicate the level of each specific knowledge item. The internal consistency (Cronbach's alpha) of the score for knowledge items was found to be 0.653. After 2 weeks, test-retest reliability was assessed on the same 80 participants, and found to be 0.2-0.5, with most kappa values > 0.1. Based on the outcome of the construct validation and test-retest, the questionnaire was revised again before incorporation into the actual study.

Ethical considerations

The study was approved by the Medical Ethics Committee at the University of Malaya Medical Centre, Kuala Lumpur, Malaysia (MECID no: 968.3) and the Ministry of Education, Malaysia. Further permission was obtained from the education departments in each of the states and federal territories, and from the principals of the selected schools. Informed consent was sought from the students, and their participation in the study was voluntary.

Statistical Analyses

All statistical analyses were performed with the Statistical Package for the Social Sciences version 20.0 (IBM, New York, USA). Skewness, kurtosis of the distribution curve and Shapiro-Wilk testing indicated that the data were normally distributed. Descriptive statistics included the calculation of frequencies, mean scores and standard deviation for demographic variables, knowledge and health belief items. Independent t-test, one-way analysis of variance (ANOVA) and paired t-test methods were used for comparison of the means and to test the associations between socio-demographic variables and the mean knowledge score and mean total health beliefs score. The level of statistical significance was set at $p < 0.05$.

Results

Characteristics of the survey sample

A total of 2,644 students responded to the pre-vaccination survey and 2,005 (70%) completed the post-vaccination survey. The 639 participants who were not included in the analyses were students who were not present during the post-vaccination survey or who did not complete the 3 doses of HPV vaccine. Demographic characteristics were the same for

the participants in the post-vaccination survey and the dropout group (639 participants). A summary of the participants' characteristics is provided in Table 1. Two-thirds of the participants were from urban schools (66.6%) and the rest (33.4%) were from rural schools. The ethnicity of a majority of participants was Malay (63.3%), followed by Chinese (25.6%), Indian (3.6%), and other ethnic groups (indigenous groups from Sabah and Sarawak; 7.5%). Most participants were of Muslim (67.1%) faith, followed by Buddhist (21.3%), Christian (5.2%), Hindu (3.3%), Taoist (2.2%) and others (Catholic and Sikh 0.8%). A majority of the participants perceived themselves as moderately religious (79.0%). Most of the participants' mothers were housewives (66.6%) and the majority of their fathers were skilled workers (64.5%). Most of the participants (71.4%) were from households with a monthly income below MYR 3000. More than one-fifth of the participants (21.5%) noted that they were briefed about HPV and the HPV vaccine by school authorities (Table 1).

Student Knowledge about HPV and HPV Vaccination

Of the 2005 participants, the majority (78.8%) had received information about HPV infection from a variety of sources before vaccination, including teachers (55.1%), television/radio (48.3%) and parents (47.0%). By comparison with pre-vaccination results, the proportion of the students who agreed with the following statements, 'HPV vaccines are available to prevent HPV infection' and 'Most people who become infected with HPV do not even know they have it' increased significantly from 57.4% to 76.8%, and from 48.1% to 63.0%, respectively (Table 2). Before vaccination many erroneously believed that 'Only females get HPV infection' (91.8%). Unfortunately, a significant increase in those agreeing with the statement was observed after the vaccination (96.1%). Most of the participants

also had the misconception that 'HPV vaccine gets rid of the need for Pap smear tests' (82.1%) before vaccination, and the proportion only decreased slightly after they have received the vaccine (73.6%).

The mean knowledge score before vaccination was only 2.71 (SD ± 2.20) out of a possible 10; however, it increased significantly to 3.35 (SD ± 1.72) after HPV vaccination ($p < 0.001$). As shown in Table 3, there were increases in the mean knowledge scores post-vaccination among female students of different ethnicities ($p = 0.002$), religions ($p < 0.001$), father's occupation groups ($p = 0.014$) and those who had HPV instruction by the school health team ($p < 0.001$). The study found that the mean knowledge increases post-vaccination were significantly higher among Malay and Muslim students than among other ethnicities ($p < 0.001$). It was also found that the mean difference in knowledge score was significantly higher among respondents with fathers of higher occupational status and who were from the schools that had already launched HPV promotion programs (Table 3).

Beliefs about HPV and HPV vaccination

The beliefs about HPV vaccination were compared before and after vaccination among the same participants (Table 4). Before getting vaccinated, a majority of the participants agreed that 'Taking the HPV vaccine is a good idea because it is recommended by the government' (58.3%), and 'The HPV vaccine would be a good way to prevent HPV infection' (64.4%). The proportion of the students that agreed with these statements increased to 79.24% and 86.3%, respectively after receiving the HPV vaccine. However, both pre- and post-vaccination, only a few perceived themselves 'at risk of HPV infection' (8.4% pre-vaccination versus 12.3% post-vaccination). More than one-quarter of the students

(28.7%) agreed with the statement 'Getting vaccines are scary and painful' before vaccination and this proportion increased to 32% post-vaccination.

The mean health beliefs score regarding HPV infection and vaccination after receiving the vaccine was 7.67 (SD ± 2.99), a significant increase from 6.99 (SD ± 3.01) pre-vaccination. Pre-vaccination, a significant relationship was observed between the mean health beliefs score with regard to the participants' ethnicity and religion. Post-vaccination, a significant relationship was found among the mean health beliefs score and the participants' ethnicity, religion, mother's occupation, father's occupation and average household monthly income. In addition, a statistically significant difference in the mean health beliefs score was found with regard to religion pre- and post-vaccination (Table 5).

Discussion

Several studies have demonstrated that HPV vaccination improves knowledge about HPV infection and the HPV vaccine among young women.[11,12] Immunisation coverage for the complete three-dosage HPV vaccine among girls aged 13 years old in Malaysia has exceeded 95% since it was introduced in 2010, accompanied by targeted public health information provided by school health teams.[3] However, in our study, the participants' overall mean knowledge score of 3.35 out of a possible 10 implies that general knowledge of HPV remains poor despite apparently successful vaccine coverage. Only 21.5% of the study participants reported receiving health information about HPV along with the HPV vaccination, and these students had a higher level of knowledge post-vaccination. This apparent failure to provide the planned information at vaccine delivery should be addressed; for example, were health teams adequately trained, or, as not all schools may have health teams, whether teachers can be trained instead to provide the information. It is

possible also that the participants did receive the information but simply could not recall having done so; the effectiveness of the material and appropriateness of the method of delivery would need to be assessed by skilled educators and redeveloped as necessary, to ensure that giving information does in fact result in better knowledge.[8] Several studies suggested that if HPV vaccination and school-based education is also accompanied by a nationwide awareness campaign, which would also educate adults of influence (such as school staff, family, and friends), students' knowledge and awareness would also increase.[11-16]

An important finding was that the students had the misconception that HPV vaccination gets rid of the need for Pap smears. Education programs should stress the need for continued cervical cancer screening, as non-vaccine types are also associated with malignancy. HPV vaccination in conjunction with regular cervical cancer screening is estimated to reduce the lifetime risk of cervical cancer by 94% and represents the best protection against this disease.[17]

A majority of students also held the misconception that only females can get HPV, and they were unaware that vaccinating boys protects both genders.[18] Understanding that non-vaccine types are also associated with disease will highlight the need for continued safe sexual practices. Furthermore, knowing the benefits of the HPV vaccine for men may encourage them to advise their male partners to be vaccinated against HPV. HPV vaccines are now approved for males in several countries including Malaysia, although boys are not currently included in the national program. The inclusion of boys in vaccination programs is likely to be the most effective strategy in overall HPV disease reduction in both females and males, especially if vaccine coverage of girls is less than 50%, although cost-benefit analysis should be carried out in different settings.[19-21] Educating fathers or father figures about HPV

vaccine and cervical cancer is also particularly important as they are sources of advice on sexual health issues for young boys .[22]

This study indicated that the source of most female students for knowledge about HPV was teachers, followed by television and parents. This supports our previous study which showed parent-child reluctance to discuss sexual reproductive issues is an important issue in Malaysia's conservative society.[23] Teachers therefore will potentially play the key role in education of schoolgirls, and are well-placed to do so in conjunction with vaccine delivery in schools, but would need to be supported with training. A survey of 1166 Malaysian teachers (94% were women) demonstrated generally poor knowledge about HPV, with only 12.7% feeling that they had adequate knowledge to counsel about the vaccine, and 96.8% welcoming more information[24]. Nevertheless, parents' communication with their daughters about the HPV vaccine and sexual health should also be encouraged, and parents could also be invited to school education programs to both educate them and raise their confidence in discussing this issues with their children.

Previous studies reported that initiation of HPV vaccination was the main reason for an increase in the perceived risk of HPV infection among young women,[25-27] and that this higher perceived risk was associated with greater knowledge about HPV infection.[28] Our study demonstrated that perceived risk and severity of HPV infection remained low after HPV vaccination, which is likely to reduce the drive to acquire knowledge. Emphasizing potential risk and severity is therefore an important component of educating schoolgirls; although they appear to accept vaccination, prevention of sexually-acquired infections and cervical cancer requires appreciation of the risks and long-term practices.

The key limitation of this study was that all measures were based on participant self-reporting, with no attempt to independently verify respondents' demographic information; thus, there might be a risk of reporting bias. Additionally, this study is a cross-sectional study, which might induce researchers to infer causation. Despite these limitations, this study included a large sample from all over Malaysia, and allowed assessment of female students across the country.

Conclusion

Despite the free HPV vaccine being taken up by most female students as a part of the National HPV Vaccination Programme, post-vaccination knowledge regarding HPV infection and the HPV vaccine remained poor. With regards to health beliefs, low perceived susceptibility to the HPV infection and severity of HPV were found. However, only 21.5% of students reported receiving health information about HPV and the HPV vaccine, and they showed a higher level of knowledge. Targeted public health information provided by school health teams and teachers at the school level is vitally important to enhance knowledge and positive health beliefs along with the provision of the HPV vaccine. This includes educating girls about the importance of HPV vaccination for males, and the need to adopt long-term practices to reduce sexual transmission of HPV and cervical cancer, as vaccination alone is not enough.

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The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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Table 1: Socio-demographic characteristics of the participants (n=2005)[a].

Characteristics	Frequency N (%)
Ethnicity	
Malay	1269 (63.3)
Chinese	514 (25.6)
Indian	72 (3.6)
Others	150 (7.5)
Religion	
Muslim	1345 (67.1)
Buddhist	428 (21.3)
Taoist	44 (2.2)
Hindu	66 (3.3)
Christian	105 (5.2)
Others	17 (0.8)
Religiosity	
Very religious	375 (18.7)
Moderately religious	1583 (79.0)
Not at all religious	47 (2.3)
Mother's occupation[c]	
Professional and managerial	342 (18.1)
Skilled worker	291 (15.4)
Housewife	1261 (66.6)

Father's occupation[c]	
Professional and managerial	548 (31.1)
Skilled worker	1136 (64.5)
Unemployed	77 (4.4)
Average household monthly income[b,c]	
<MYR1000	698 (36.7)
MYR1000-3000	692 (36.3)
MYR3000-5000	317 (16.6)
>MYR5000	197 (10.3)
Received HPV or HPV vaccine information from school	
Yes	431 (21.5)
No	1574 (78.5)

[a] All values are based on participants' self-reporting.

[b]The national average monthly household income in Malaysian Ringgit (RM) is RM 3686 (US$1=MYR3.23 in July, 2013, date of data collection). Source: Mid-term review of the Ninth Malaysia Plan 2006-2010, Economic Plan Unit (EPU), Prime Minister's Department, 2008

[c]Totals may be less than 2005 due to missing data, refusal to participate, or absence of pupil.

Table 2. Percentage of correct responses regarding HPV infection and HPV vaccination for pre- and post-test vaccination (n=2005).

List of knowledge items	Correct responses, n (%)		*p*-value
	Pre-vaccination	Post-vaccination	
HPV infections are common and many have been infected.	542 (27.0)	610 (30.4)	0.012
Most people who become infected with HPV do not even know they have it.	964 (48.1)	1264 (63.0)	<0.001
Only females get HPV infection.	164 (8.2)	78 (3.9)	<0.001
HPV can cause cervical cancer.	1077 (53.7)	1263 (63.0)	<0.001
Genital warts are caused by HPV.	249 (12.4)	298 (14.9)	0.017
HPV is a sexually transmitted infection.	467 (23.3)	614 (30.6)	<0.001
HPV cannot be cured.	236 (11.8)	305 (15.2)	0.001
Vaccines are available to prevent HPV infection.	1151 (57.4)	1540 (76.8)	<0.001
The HPV vaccine gets rid of the need for Pap smear tests.	359 (17.9)	530 (26.4)	<0.001
Vaccinating boys with HPV can help protect girls against HPV infection.	229 (11.4)	206 (10.3)	0.214

Table 3. Association between socio-demographic characteristics and mean total knowledge scores in pre- and post-vaccination (n=2005).

Characteristics	Pre-vaccination		Post-vaccination		Mean difference in total knowledge score (±SD)	*p* value[c]
	Mean total knowledge score (±SD)	*p* value[c]	Mean total knowledge score (±SD)	*p* value[c]		
Ethnicity[a]						
Malay	3.06 (2.15)	<0.001***	3.66 (1.65)	<0.001***	0.60 (2.44)	0.002**
Chinese	2.27 (2.15)		2.70 (1.79)		0.42 (2.58)	
Indian	3.27 (2.16)		2.93 (1.88)		-0.33 (2.75)	
Religion[a]						
Muslim	3.08 (2.13)	<0.001***	3.67 (1.65)	<0.001***	0.59 (2.42)	<0.001***
Buddhist	2.26 (2.19)		2.60 (1.78)		0.34 (2.60)	
Taoist	1.88 (2.01)		2.69 (1.47)		0.81 (2.68)	
Hindu	3.33 (2.18)		2.85 (1.91)		-0.47 (2.75)	
Christian	2.07 (2.32)		3.60 (1.63)		1.53 (2.66)	

Religious status						
Very religious	3.11 (2.36)	0.001**	3.48 (1.65)	0.350	0.37 (2.54)	0.086
Moderately religious	2.78 (2.14)		3.38 (1.75)		0.60 (2.49)	
Not at all religious	2.90 (2.35)		3.45 (1.96)		0.55 (2.51)	
Mother's occupation						
Professional and managerial	2.95 (2.06)	0.219	3.76 (1.69)	<0.001***	0.81 (2.40)	0.387
Skilled worker	2.93 (2.27)		3.46 (1.74)		0.53 (2.60)	
Housewife	2.80 (2.20)		3.29 (1.74)		0.49 (2.50)	
Father's occupation						
Professional and managerial	3.03 (2.07)	<0.001***	3.58 (1.65)	0.013***	0.55 (2.35)	0.020*
Skilled worker	2.71 (2.21)		3.33 (1.78)		0.62 (2.55)	
Unemployed	3.59 (2.43)		3.25 (1.64)		-0.34 (2.61)	
Average household monthly income[b]						
<MYR1000	2.72 (2.27)	0.013*	3.37 (1.83)	<0.001***	0.64 (2.63)	0.176

MYR1000-3000	2.79 (2.14)		3.26 (1.66)		0.47 (2.40)	
MYR3000-5000	3.02 (2.17)		3.44 (1.65)		0.42 (2.53)	
>MYR5000	3.13 (2.06)		3.92 (1.73)		0.79 (2.36)	
HPV promotion by school health team						
Not conducted	3.15 (1.99)	<0.001***	3.32 (1.74)	0.729	0.17 (2.34)	<0.001***
Conducted	2.59 (2.24)		3.35 (1.72)		0.76 (2.51)	

[a]Number of participants was less than 2,005 due to exclusion of other ethnic groups in the analysis.

[b]The national average monthly household income in Malaysian Ringgit (RM) was RM3.686 (US$1=MYR3.23, as of July, 2013).

Source: Mid-term review of the Ninth Malaysia Plan 2006-2010, Economic Plan Unit (EPU), Prime Minister's Department, 2008.

[c]Parametric tests (independent samples *t* test and one-way ANOVA)

***P<0.001; **P<0.01; *P<0.05

Table 4. Health beliefs pre- and post-HPV vaccination (n=2005).

Statements	Frequency Pre-vaccination	Pre-vaccination Agree N (%)	Pre-vaccination Don't know/ Disagree N (%)	Frequency Post-vaccination	Post-vaccination Agree N (%)	Post-vaccination Don't know/ Disagree N (%)	*p*-value
General health beliefs							
HPV vaccine is good for health just like all other vaccines.	2005	1106 (55.2)	899 (44.8)	2005	1388 (69.2)	617 (30.8)	<0.001
Taking the HPV vaccine is a good idea because it is recommended by the government.	2005	1172 (58.5)	833(41.5)	2005	1588 (79.2)	417 (20.8)	<0.001
Perceived benefit							
The HPV vaccine would be a good way to prevent HPV infection.	2005	1292 (64.4)	713 (35.6)	2005	1731 (86.3)	274 (13.7)	<0.001
Perceived susceptibility toward HPV							
Do you think you will get infected with HPV?	2005	168 (8.4)	1837 (91.6)	2005	247 (12.3)	1758 (87.7)	0.009
Feeling of worry							

I am worried about getting infected with HPV.	2005	1123 (56.0)	882 (44.0)	2005	1378 (68.7)	627 (31.3)	<0.001
Perceived severity							
Infection with HPV can lead to serious illness.	2005	868 (43.3)	1137 (56.7)	2005	1130 (56.4)	875 (43.6)	<0.001
Perceived barriers							
Getting vaccines are scary and painful	1586	455 (28.7)	1131 (71.3)	1997	640 (32.0)	1357 (68.0)	<0.001
HPV vaccines are not safe for me.	1545	129 (8.3)	1416 (91.7)	1997	191 (9.6)	1806 (90.4)	<0.001
I don't think HPV vaccine will prevent HPV infection.	1545	309 (20.0)	1236 (80.0)	1997	243 (12.2)	1754 (87.8)	<0.001
HPV vaccine may encourage people to have sex at an early age.	1542	106 (6.9)	1436 (93.1)	1984	127 (6.4)	1857 (93.6)	<0.001
HPV vaccine may encourage people to have multiple sexual partners.	1542	82 (5.3)	1460 (94.7)	1983	98 (4.9)	1885 (95.1)	<0.001
My parents might not allow me to get the HPV vaccine.	1542	86 (5.6)	1456 (94.4)	1978	146 (7.4)	1832 (92.6)	<0.001
My religion prohibits me from receiving HPV vaccine because it is sex-related.	1542	32 (2.1)	1510 (97.9)	1977	45 (2.3)	1932 (97.7)	<0.001

Table 5. Association between socio-demographic characteristics and mean total health beliefs scores in pre- and post-vaccination periods (n=2005).

Characteristic	Pre-vaccination		Post-vaccination		Mean difference of total health beliefs score (±SD)	*p*-value
	Mean total health beliefs score (±SD)	*p* value[c]	Mean total health beliefs score (±SD)	*p* value[c]		
Ethnicity[a]						
Malay	7.49 (2.92)	<0.001***	8.37 (2.69)	<0.001***	0.82 (3.38)	0.381
Chinese	5.60 (2.83)		6.38 (3.28)		0.88 (3.85)	
Indian	6.22 (2.89)		6.50 (3.06)		-0.60 (4.12)	
Religion[a]						
Muslim	7.44 (2.95)		8.34 (2.66)		0.83 (3.37)	
Buddhist	5.52 (2.80)	<0.001***	6.27 (3.34)	<0.001***	0.81 (3.84)	0.038*
Taoist	6.48 (2.11)		6.84 (2.91)		-0.16 (3.76)	

Hindu	6.41 (2.82)		6.45 (3.04)		-0.43 (3.86)	
Christian	6.10 (2.93)		7.80 (3.09)		1.73 (3.97)	
Religious status						
Very religious	7.04 (2.73)	0.132	8.04 (2.76)	0.056	1.02 (3.30)	0.487
Moderately religious	7.03 (3.06)		7.76 (3.02)		0.76 (3.54)	
Not at all religious	5.97 (3.17)		7.35 (3.17)		1.13 (3.81)	
Mother's occupation						
Professional and managerial	7.22 (2.99)	0.248	8.29 (2.74)	0.003**	1.11 (3.16)	0.412
Skilled worker	7.08 (2.90)		7.84 (2.86)		0.92 (3.53)	
Housewife	7.00 (3.06)		7.65 (3.05)		1.13 (3.81)	
Father's occupation						
Professional and managerial	7.36 (2.84)	0.014	8.25 (2.87)	<0.001***	0.96 (3.23)	0.697
Skilled worker	6.88 (3.09)		7.56 (3.02)		0.74 (3.64)	
Unemployed	7.17 (3.24)		8.01 (2.66)		0.90 (3.63)	

Average household monthly income[b]						
<MYR1000	6.91 (3.18)	0.005	7.58 (3.04)	<0.001***	0.76 (3.88)	0.566
MYR1000-3000	7.04 (2.97)		7.67 (3.00)		0.77 (3.30)	
MYR3000-5000	7.17 (2.94)		7.99 (2.84)		0.74 (3.33)	
>MYR5000	7.58 (2.70)		8.64 (2.72)		1.25 (3.26)	
HPV promotion by school health team						
Launched	7.03 (3.00)	0.387	7.51 (2.85)	0.135	0.65 (3.56)	0.225
Not launched	7.10 (3.01)		7.89 (3.00)		0.90 (3.44)	

[a]Number of participants was less than 2,005 due to exclusion of other ethnic groups in the analysis.

[b]The national average monthly household income in Malaysian Ringgit (RM) was RM3.686 (US$1=MYR3.23, as of July, 2013).

Source: Mid-term review of the Ninth Malaysia Plan 2006-2010, Economic Plan Unit (EPU), Prime Minister's Department, 2008.

[c]Parametric tests (independent samples *t* test and one-way ANOVA)

***P<0.001; **P<0.01; *P<0.05